

Tioronda Bridge
South Avenue, spanning Fishkill Creek
Beacon
Dutchess County
New York

HAER No. NY-168

HAER
NY,
14-BEAC,
3-

PHOTOGRAPHS
WRITTEN HISTORICAL DATA
REDUCED COPIES OF MEASURED DRAWINGS

HISTORIC AMERICAN ENGINEERING RECORD

TIORONDA BRIDGE

HAER No. NY-168

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NY,
14-BEAC,
3-

Location: South Avenue spanning Fishkill Creek, City of Beacon, Dutchess County, New York. Approximately 4,000 feet south of Main Street (Route 9D) and 2,200 feet northeast of the mouth of Fishkill Creek at the Hudson River.

UTM: N 4593280
E 585600
New York State Quad: West Point

Dates of
Construction: Between 1872 and 1873. Original wooden floor stringers replaced by steel I beams in 1955.

Present Owners: City of Beacon, New York.

Present Use: Vehicular and pedestrian bridge, temporarily closed, May 1987.

Significance: A rare surviving example of the iron "bowstring" arch truss bridge patented by Glass, Schneider, and Reznier on December 10, 1867, (Patent No. 71,868) and built by the Ohio Bridge Company, Cleveland, Ohio. Bridge utilizes the skewback (foot block) patented by Reznier on July 1872, (Patent No. 128,509). The Tioronda Bridge is listed in the National Register of Historic Places.

Project
Information: The documentation of the Tioronda Bridge was prepared by the Historic American Engineering Record (HAER), National Park Service, during the Summer of 1987 for the New York State Historic Bridges Recording Project. This project was sponsored by the New York State Department of Transportation and under the supervision of Eric DeLony, Chief & Principal Architect, HAER. This report was written by Charles Scott, with research assistance from Andrew Cole. When citing this report, please credit the Historic American Engineering Record and the authors.

DESCRIPTION OF THE BRIDGE

The Tioronda Bridge, carrying South Avenue across Fishkill Creek in the City of Beacon, New York, was erected in early 1872. This bridge is a rare surviving example of the iron "bowstring" truss bridge patented by John Glass, George P. Schneider, and William B. Rezner on December 10, 1867 (No. 71,868). The bridge also utilizes a distinctive, adjustable cast iron skewback (foot block) patented by William B. Rezner on July 2, 1872 (No. 128,509). Each abutment and pier supports a cast iron plate with a concave top. Set into this plate is a triangular-shaped, cast iron block with a convex shaped bottom and a sloping side abutting the end of the "bowstring" arch. A wide rib on the face of the sloping side projects into the hollow arch tube. The skewback was designed to hold the tubular iron arch in place and transmit compressive force from the arch to the abutments and piers.

The Tioronda Bridge consists of three arch spans with an overall length of 110 feet and sits approximately 16 feet 6 inches above the waters of Fishkill Creek. Each span is a slightly different length, measuring (from south to north), 35 feet 8 inches, 37 feet 10 inches, and 32 feet 8 inches. The two abutments and two piers are all rubble stone with ashlar coursing. Piers measure 6 feet wide and 23 feet 6 inches long at the top and taper outward at the base. The Tioronda bridge was built by the Ohio Bridge Company of Cleveland, a company formed by Class, Schneider, and Rezner in 1869. The Ohio Bridge Company, one of the many small bridge building companies to appear and briefly prosper in the years after the Civil War, ceased to exist after the "financial panic" of the last few months of 1873.

ORIGINS OF THE TIORONDA BRIDGE

The Tioronda Bridge is located within the City of Beacon. Beacon was formed in 1913 as a result of the merger of the hamlets of Matteawan and Fishkill Landing, originally hamlets within the Town of Fishkill. Tioronda, also known as Byrnsville, was a smaller settlement upstream from the mouth of the Fishkill Creek, approximately one mile south of Fishkill Landing. Tioronda was also part of the Town of Fishkill and the site of grist, saw, and cotton mills and in the late 1800's the home of the Tioronda Hat Works. Fishkill was a prosperous and industrially active town with railroad and highway transportation routes running both east and west as well as north and south. The Tioronda bridge no doubt was important in linking the activities of these adjacent water-powered mills and manufacturing sites with the Town of Fishkill's railroad transportation lines and other manufacturing establishments.

On December 26, 1871 the Town of Fishkill Board of Supervisors passed a resolution approving the expenditure of \$2,700 for a new iron bridge across Fishkill Creek at Tioronda. Two days later Edward M. Goring, the Fishkill representative to the Dutchess County Board of Supervisors, requested and obtained the permission of the Board of Supervisors for the town to borrow

\$2,700 to build the bridge. The bridge bonds were to pay seven percent annual interest and be repaid in full by March 1, 1873.

With permission to borrow the funds granted in December 1871 it is likely that construction of the bridge proceeded as soon as weather permitted in 1872. The use of the skewback patented by Rezner in July 1872 adds weight to this assumption. Most likely, the skewback was introduced and utilized prior to the patent approval, making the installation of the skewback in the Tioronda Bridge a very early application of Rezner's patented design.

In 1871 the Town of Fishkill recorded a payment of \$588.98 to Daniel Green for "Tioronda (sic) Bridge," possibly for the construction of the two stone abutments and two stone piers upon which the bridge was erected. During this time period bridge building companies required that the abutments and piers be built by the town under a separate contract with a local mason. In 1872, the Ohio Bridge Company was awarded a contract to build an iron truss swing bridge across Wappingers Falls, also in the Town of Fishkill. This contract required the county to "furnish and have ready the substructure [abutments and center pier] of the bridge."

The Ohio Bridge Company was represented by Henry C. Haskell. Haskell operated the Albany Iron and Machine Works and advertised his company as the manufacturer of "steam engines and boilers...bridge and roof bolts...iron work of all kinds, railings, balconies, verandas, iron bridges, wrought iron beams, doors and shutters" and also "Reyner, (sic) Stone & Co.'s [most likely is an erroneous reference to Rezner, Glass, and Schneider] patent improved Wrought Iron Tubular Arch Truss Bridge."

With Haskell as the agent of the Ohio Bridge Company in 1871, it is possible that the iron for the Tioronda Bridge was fabricated by the Albany Iron and Machine Works at its 50-56 Liberty Street foundry.

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Poughkeepsie Eagle, December 4, 1872; December 17, 1873.

Smith, James H. History of Dutchess County, Part 2. Syracuse, N.Y.: Mason,
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The Tourists Guide Through the Empire State, 1871. (Available at the Albany
Room Collection, Albany Public Library, Albany, New York.)

Tioronda Bridge File, City of Beacon, Office of the Street Superintendent,
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United States Patent, Number 71,868, December 10, 1867.

United States Patent, Number 128,509, July 2, 1872.

OHIO BRIDGE COMPANY,

CLEVELAND, OHIO.

SPECIFICATIONS for Superstructure of Bridge on the plan known as
Rezner & Stone's Oval Wrought Iron Tubular Arch Truss Bridge.

PATENTED DECEMBER 10, 1867.

For the Bridge over the Stream called Oconomowoc where the
Main St. road crosses said Stream, in the Oconomowoc County
of Waukesha and State of Wisconsin

PLAN AND GENERAL DIMENSIONS OF BRIDGE.

General plan of Bridge as per accompanying drawing. Extreme length of Bridge to be 30 feet in one span of 130 feet each. Extreme length of trusses to be 134 feet; extreme depth to be 13 feet. Each truss to be divided into 13 panels. Length of end or panel, No. 1, from end of midriff to center of post, 10 1/3 feet. Length of panel No. 2, 10 1/3 feet. Length of panel No. 3, 10 1/3 feet. Length of panel No. 4, " " feet. Length of panel No. 5, " " feet. Length of panel No. 6, " " feet. Length of panel No. 7, " " feet. Length of panel No. 8, " " feet. Length of panel No. 9, 10, 11, 12, 13 Same as others measuring from centers of posts.

Bridge to have one roadway 18 feet wide in the clear between arches, and 7 sidewalk 5 feet clear between arches and outer railing.

IRON WORK.

Arches to be made of an upper and lower crest and midriff, or flat plate, of best quality of wrought iron. Crests to be rolled in an elliptical form, as set forth in accompanying drawing, and the three curved, combined and riveted up from end to end, through flanges, with 1/2 inch rivets, 6 inches from center to center. The ends of the arches, where they abut against the foot blocks, to be re-inforced on the underside by a plate not less than eighteen inches long and of the same thickness as the crest, and firmly riveted through the crests and midriff with 1/2 inch rivets, placed two and one-fourth inches from centers. All splices in the arches, except at shipping joint, to be tied together by plates twelve inches long and conforming in shape to the inner side of the crest, and firmly riveted thereto by twelve 1/2 inch rivets in each splice. Splices at the shipping joint to be made with plates as above, riveted at one end and securely fastened at the other by six 1/2 inch set screws at each splice. The splices in the midriff to be made with plates riveted on each side with four 1/2 inch rivets. The several parts to break joints not less than 30 inches, and to abut neatly and fairly against each other.

Outside dimensions of arch 11 inches deep and 10 inches across the flanges, to be made of the best quality of Lake Superior Iron

All rivets to be hot pressed and hot riveted. There are to be two chords in each truss, to be made of refined bar iron 6 inches deep and 3/4 inches thick, to be welded the full length of convenient length for shipping and united with pin joints. Each pin to have an equal amount of iron with the chord

Ends of Chords. truss without break or cut in the iron. Two feet on each end of chords to be made of $2\frac{1}{4}$ inch round iron with thread cut on same, and to pass through and be secured to foot block by a nut.

Foot Block. Foot block to be made of good cast iron, made in two parts, as shown on plan, and to be neatly fitted to ends of arch.

Posts. Posts Nos. 1 2 3 to be made of $2\frac{1}{2}$ inch *Star* iron. Posts 4 5 to be of 3 inch *Star* iron. Posts 6 to be of 3 inch *Star* iron. All posts to have collars forged at the point where the post strikes the arch. Size of post from collar to top end to be $1\frac{1}{4}$ inches, with a thread cut on same and to pass through and be secured to arch by nut and washer. Lower ends of posts, where they pass between the chords, to be $1\frac{1}{4}$ inches, with thread cut on same and fastened to the chords with nuts and washers, above and below, as shown on plan. Counter braces to be of refined round bar iron. Counter braces in panels No. 1 running from end of arch toward center of chord to be 1 inch.

Collars on Posts. In panels No. 2, 3 & 4 $\frac{7}{8}$ inches. In panels No. 5, 6 & 7 1 inch.

Arch connection. In panels No. — inches. In panels No. — inches.

Chord connections. In panels No. — inches. In panels No. — inches.

Counter Braces. Counter braces in panels No. 2, 3 running from center of arch towards ends of chords $\frac{7}{8}$ inches. Counter braces in panels No. — running from center of arch towards ends of chords — inches in panels No. 5, 6 & 7. $\frac{7}{8}$ inches. Counter braces in panels No. — running from center of arch towards ends of chords — inches in panels No. — inches. All counter braces to have a thread on each end to pass through and be secured to arch at top end by nut and washer, and lower end to pass between the chords and through washers under the chords and fastened to the same by nut, as shown on plan. Lateral braces for floor to be made of $\frac{3}{4}$ inch round iron, of which there are to be two in each panel, running diagonally from post to post, and to have a thread cut on each end to pass through the post washer under chord and fastened by a nut. There are to be 4 brace beams to each span of bridge, to be made of 6 inch *Phoenix* beam iron, to be put on top of chords at posts Nos. — and fastened to the chords by a clamp washer, and to the posts by a yoke passing around the same and through the beam and secured by a nut, as shown in detail on plan. The beams to extend $2\frac{1}{2}$ inches over the chords. Each brace beam to have four eyes riveted thereto made of $2\frac{1}{2}$ inch flat iron, and placed $2\frac{1}{2}$ inches on each side of post to receive lower ends of arch braces. Arch braces to be made of $2\frac{1}{2}$ inch *Star* iron, with upper ends in T form and put on in pairs, and crossing each other under the arch and fastened to flanges of arch on opposite sides by two $\frac{1}{2}$ inch bolts in each brace. The lower end of arch braces to be made of $1\frac{1}{4}$ inch round iron with thread cut thereon, and to pass through and be secured to eyes on brace beam by nuts above and below the eyes. Posts for top bracing to be made of cast iron, to be of sufficient length to make headway 12 feet in the clear from top of floor to bottom of cross braces, to be cast at bottom end so as to conform to the shape of the arch, with bolts in center of $1\frac{1}{4}$ inch round iron, to be fastened to the arch by bolt passing through the same with thread, nut and washer on lower end. Cross ties on top to be made of two pieces of 2 inch *angle* iron, with thimbles between them, not more than 7 feet apart and riveted together with $\frac{1}{2}$ inch rivets passing through the flange iron and thimbles so as to make the depth of the cross tie 6 inches at the center and 3 inches at the ends, with pieces of 1 inch round iron welded on at the ends, with thread cut on same and passing through and fastened to posts on top of arches by nuts. There are to be 8 posts and cross ties to each span, and placed 14 feet from the center of trusses respectively. Washers to be made of such shape as to conform to the arch and chords as shown in detail on plan. Sidewalk posts to be made of cast iron in star form, with base six inches square and three-fourths of an inch thick. Posts to be 3 feet high and fastened to floor by four $\frac{1}{2}$ inch bolts to each post. Posts not to be more than seven feet apart. Railing to be made of three pieces of $1\frac{1}{2}$ inch *round* iron and one piece of T iron for the cap of railing.

All iron work to be of the best quality of refined iron, and all work to be done in a thorough workmanlike manner.

PAINTING.

All closed iron work to have 1 coat of metallic paint before being riveted together, and all iron work to have 2 coats of paint, *when finished*

Painting.

WOOD WORK.

Floor joists to be of sound *Oak or Pine* timber 3 inches thick and 1 1/4 inches deep, to be placed 2 0 ^{*inches*} feet apart from center to center and to extend over the chords a *sufficient length to make a sidewalk* to be be notched down on the chords 1 inches. Floor plank to be of sound *Oak or Pine* lumber 2 1/4 inches thick and not more than 10 inches wide, and laid diagonally, as shown on plan. Plank to be firmly spiked to the joist with 5 inch spikes. End of plank to be secured by strips 3 inches thick and 9 inches wide, and firmly fastened down by 5 inch spikes. Sidewalk plank to be of sound *Oak or Pine* lumber 2 inches thick and not more than 10 inches wide, and to be laid longitudinally, as per drawing. Sidewalk plank to be securely fastened to joists by 5 inch spikes. Hub plank to be of sound *Oak or Pine* lumber 1 1/4 inches by 6 inches, to be placed — inches above the roadway, and secured to the posts by 1/2 inch bolts *and clamps*.

Joist.

Floor Plank.

Spikes.

Sidewalk Plank.

Hub Plank.

The above bridge warranted to sustain 2000 lbs. lineal foot. Which is but 1/4 of its real capacity.*

To the President of the Board
of
the Commissioners of Waukesha County, Wisconsin

The undersigned propose to do all the iron work, and furnish all the material requisite and necessary to complete, in a workmanlike manner, the superstructure of the Bridge over the stream called Oconomowoc where Main Street crosses said stream in the Town of Oconomowoc County of Waukesha, and State of Wisconsin, on the plan known as **REZNER & STONE'S PATENT WROUGHT IRON ORAL ARCH TRUSS BRIDGE**, according to the general plan submitted, and specifications as given below:

Length of Bridge 130 feet, to be built in one span of 134 feet
to have one Roadway 8 or more as required feet
and two side walks and for the sum of Thirty Eight (\$38) Dollars
per lineal foot.

Said bridge to be built in
accordance with accompanying
plan and specifications.

Bridge warranted to sustain
2000# per lineal foot which
is about 1/3 of its real capacity
and to be in workman ship
and design satisfactory to
the Board.

The time of completion left optional
with the board.

If the above bid is accepted
we will for ward contracts

Now, should this bid be accepted, the undersigned Ohio Bridge Company, of Cleveland,
agree to enter into contract, with good and sufficient sureties, to do the above work at the price
named.

Jan 30 1877

Ohio Bridge Co
Agner Jr